

Planning and Quality Assurance Affairs

Form (A)

Course Specifications

General Information

Course name	Introduction to Math. Physics
Course number	PHYS2401
Faculty	
Department	
Course type	Major Needs
Course level	2
Credit hours (theoretical)	4
Credit hours (practical)	0
Course Prerequisites	

Course Objectives

- 1 - study First-Order ODEs
- 2 - Second-Order Linear ODEs
- 3 - Vector Differential Calculus. Grad, Div, Curl

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## Course Contents

- 1 - Basic Concepts. Modeling
- 2 - Geometric Meaning of  $y' = f(x, y)$ . Direction Fields, Euler's Method
- 3 - Separable ODEs. Modeling
- 4 - Exact ODEs. Integrating Factors
- 5 - Linear ODEs. Bernoulli Equation. Population Dynamics
- 6 - Orthogonal Trajectories. Optional
- 7 - Homogeneous Linear ODEs of Second Order
- 8 - Homogeneous Linear ODEs with Constant Coefficients
- 9 - Differential Operators. Optional
- 10 - Modeling of Free Oscillations of a Mass–Spring System
- 11 - Euler–Cauchy Equations
- 12 - Existence and Uniqueness of Solutions. Wronskian
- 13 - Nonhomogeneous ODEs
- 14 - Modeling: Forced Oscillations. Resonance
- 15 - Modeling: Electric Circuits
- 16 - Solution by Variation of Parameters
- 17 - Vectors in 2-Space and 3-Space
- 18 - Inner Product (Dot Product)
- 19 - Vector Product (Cross Product)
- 20 - Vector and Scalar Functions and Their Fields. Vector Calculus: Derivatives
- 21 - Curves. Arc Length. Curvature. Torsion
- 22 - Gradient of a Scalar Field. Directional Derivative
- 23 - Divergence of a Vector Field
- 24 - Curl of a Vector Field

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## Teaching and Learning Methods

- 1 - The course is given as lecture and discussion, where several problems on the material are solve at the end of each unit. In addition some assignments are given to the students as a homework.

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## Books and References

Essential books	ADVANCED ENGINEERING MATHEMATIC ERWIN KREYSZIGS 10TH ed
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